DOCUMENT RESUME

ED 141 953 EA 009 770

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TITLE School Sites: Development and Utilization for Environmental Studies. Project KARE: A National Model for Strengthening Environmental Studies in Local Schools.
INSTITUTION Montgomery County Intermediate Unit 23, Blue Bell, Pa.; Research and Information Services for Education, King of Prussia, Pa.
PUB DATE [75]
NOTE 39p.; For a related document, see ED 087 692

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Activity Learning; Bibliographies; Curriculum Development; Curriculum Guides; Educational Innovation; Elementary Secondary Education; *Environmental Education; Interdisciplinary Approach; Landscaping; Needs Assessment; *Outdoor Education; *Resource Guides; *Site Analysis; *Site Development; Student Participation; Trails

ABSTRACT

Some directions and avenues of thought are suggested to help school personnel develop sites for environmental education. In approaching the use or development of a site, important steps are (1) involving students, teachers, administrators, parents, and community representatives; (2) determining educational goals on the basis of students' needs; and (3) developing a resource list. Suggestions are made of ways different disciplines can be involved with the site, emphasizing that action-oriented activities are the ones most successful with students. Three site analyses prepared for schools considering development of their properties are included to provide more detailed use and development instructions, to give an idea of the variety of usable natural sites, to suggest possible planning formats, and to illustrate what a completed inventory and plan might look like. A bibliography, a list of relevant organizations, and a site analysis inventory checklist conclude the report. (Author/MLF)

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Project KARE

A National Model for Strengthening Environmental Studies in Local Schools

SCHOOL SITES

DEVELOPMENT AND UTILIZATION FOR ENVIRONMENTAL STUDIES

SCHOOL SITES

DEVELOPMENT AND UTILIZATION

FOR ENVIRONMENTAL STUDIES

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INTRODUCTION

Currently we are hearing much about environmental education, conservation education, outdoor education, residential experiences, environmental living, community education, environmental playgrounds, etc.... All of these varying approaches presume the use of a site other than the traditional classroom. What and where is the appropriate place? I say, "Anywhere!"

If I could introduce three cliches now, I'll have them out of my system and we can proceed.

1. Ask the kids, they know.
2. Sites are not so much in need of development as they are in need of utilization. Check your Yellow Pages!
3. Don't mow, let it grow.

In approaching the use or development of a site, involvement is crucial. That is, involvement on the part of students, teachers, administrators, custodians, parents, and community representatives. All those that will be involved in the process or product of development should have input into its planning. Keep in mind that in environmental education we're interested primarily in the learning process with physical end products having far less importance. If you never achieve your physical developmental goals but you have the kids learning all along, then your project has been a success. Student-made plans are usually different from those made by teachers. That process of planning and correcting mistakes made along the way is often more instructive than a teacher's preconceived plan.

Before you begin to develop a site consider how you might use it as-is. Can activities be initiated without physical change? Are certain types of activities more appropriate than others?

When change is needed certain types of alterations are more easily accomplished than others. To stimulate interest and avoid frustration try the easy things first. Not mowing an area and instead allowing it to grow up naturally is one of the cheapest, easiest alterations that can be made.

This report does not attempt to consider all use and development options, nor does it give extremely detailed activities and plans. Rather, hopefully it will suggest some directions and open some avenues of thought to help you develop your own approaches.

NEEDS ASSESSMENT

Before you start anything ask yourself many questions. ("Yourself" being you and all the friends you've got to help.)

Who are the audience? They may be preschoolers, sixth graders, high schoolers, Boy Scouts, families, or senior citizens. The greater the diversity of user groups, the greater will be your community support and assistance.

When will it be used? You could plan for school day use, after school use, week-end use, or residential (camping) use. Seasons of use may also be critical.

What do the users want? Providing facilities that meet needs already felt by the students is far more successful than trying to develop and then respond to their now-latent needs.

What are your educational goals? Somewhere along the line you'll need to confront your purposes for trying to use a site. Some broad goals might be to develop an environmental ethic; to allow students to work cooperatively in groups; to provide an opportunity for work experience; or to equip students to be responsible citizens. More specific goals might be to learn how to map; or to stop erosion on a steep bank.

An understanding of why you need or want an outdoor site should prove helpful in choosing and using it.

RESOURCES INVENTORY

Another important question to ask is, "What's available?" Developing a resource list should be an early responsibility of your planning team. Some of the topics to consider might be: geology, topography, plant life, animal life, available habitats, water, microclimates, natural history, human history, materials available, equipment available, and expertise available. Don't necessarily restrict yourself to the surveyed property lines of your school. Is there an adjoining owner willing to participate? Are there non-adjacent properties (public or private) that you could use? Are there community functions or sites worth studying (industry, commerce, public works)? Are there regional resources to be incorporated in your network of sites? There is a wealth of materials and ideas out there. It's your job to identify them.

Now that you know what you want and what you have, you can start to make what you don't have. If that proves too difficult, maybe you should adjust your wants. In other words, the development of your needs assessment and resources inventory should be a symbiotic operation; each should reflect and support the other.

DEVELOPMENT

Since our point is education, physical development is often best done, not by professionals and with bulldozers, but by kids and with shovels. The process of development offers many learning opportunities, just as does the process of planning. Where can you apply student energy, labor, and enthusiasm to achieve your ends?

If your goals are particularily extensive or complex, approaching your end product in a series of steps may prove useful. Using an incremental approach over a longer period of time can have many side benefits. More students can be involved, with each succeeding group adding unique contributions. Frustration can be avoided by establishing achieveable sub-goals. Funds and assistance will come more easily if results are readily apparent and past use and success can be demonstrated. Taking small steps also makes it easier to change directions in response to changing student interests and community needs.

Another strongly positive effect of student input is reduced vandalism. In our experience, the vandals have often been the kids left out, the ones inadvertently alienated by non-involvement. Once programs were devised to involve these additional groups, vandalism was dramatically reduced.

Specifically, what development options are available? The limits are mostly your own enthusiasm and creativity in surmounting difficulties. Among the things often attempted are the following: establishing flower gardens, vegetable gardens (regular, organic, colonial), tree nurseries, landscaped areas, soil profile pits, and wildlife food plots; blazing trails, self-guiding trails, and trails for the handicapped; maintaining fields, and succession plots; contructing marshes, ponds, and puddles; erecting bird houses, feeders, and observation blinds; instituting weather stations; and divising outdoor classrooms. For further instructions on these topics, please refer to the "Sample Plans" included in this booklet, as well as some of the bibliographic references (Outdoor Classrooms on School Sites, Playgrounds for Free, Trail Planning and Layout, Wildlife Habitat Improvement). Better yet, let your students invent the techniques on their own.

USE

Increased use of a site is the real pay-off to development. A beautiful facility that goes unused can have a negative impact, rather than its intended result. It becomes a target for vandalism and an obstacle for the maintenence crew to mow around. The physical changes you institute should be made with their long-term use in mind. How will you integrate use of the outdoor site with your on-going curriculum?

Several approaches can be of help in this respect. The more disciplines you can get cooperatively involved in the project, the greater will be its success. If the art teacher uses your area for inspiration to the class, that's fine. But, if those art projects are in turn used by another arm of your program for documentation, advertising, or aesthetic planning, that's better. True interdisciplinarity requires that there be cross-communication and cooperation among disciplines.

Those activities that are action-oriented are the ones most successful with students. Doing something is more fun and more educationally lasting than merely reading or hearing about it.

Community involvement and participation can help not only in securing funds, aid, and expertise, but can also help convince school boards and administrations of your program's worth. Having a strong advisory committee can help ensure a project's continuance despite staff changes and school population cycles.

Following are some suggestions regarding ways different disciplines can be involved with your site.

SCIENCE:

- -Population and diversity studies using quadrat and transect sampling approaches.
- -Animal behavior studies (birds particularly).
- -Succession studies.
- -Horticulture and gardening.
- -Soil analysis (texture, chemistry, biology).
- -Soil profile studies.
- -Studies of decay, composting, natural recycling.
- -Geology studies (weathering, erosion, sedimentation, rocks, minerals).
- -Air chemistry and particulate analysis.
- -Weather and micro-climate studies.
- -Water analysis (physical factors, chemistry, biology, bacteriology).
- -Noise analysis at various sites.
- -Comparisons of the natural energy budget of the outdoor site with an energy budget for the school.

MATHEMATICS:
- -Calculations of water runoff relative to percentage of impervious surface.
- -Tabulation of diversity and population data.
- -Map making using point sighting, triangulation, or traverse techniques.
- -Orienteering exercises.
- -Manipulations of other survey data.

SOCIAL STUDIES:
- -Surveys and interviews of community residents.
- -Oral history projects.
- -Historical profiles of the site.
- -Environmental living experiences at the site.
- -Analysis of solid wastes and litter.
- -Cemetery studies.
- -Contact with local officials to get or give information and assistance.

LANGUAGE ARTS:
- -Creative writing using "Quiet Time" or "Solo" techniques.
- -Research of literature pertaining to the area.
- -Written articles, news releases, and letters-to-the-editor for publication in school and community newspapers.
- -Production of trail guide for use at the site.
- -Living history dramas for local presentation.

ART:
- -Environmental art techniques using only found objects, colors, etc.
- -Photography and other graphics to document site conditions.
- -Aesthetic planning for the site.
- -Reviews of historic paintings, photographs, etc. of the area.

PHYSICAL EDUCATION:
- -Life-time sports applicable to the site such as hiking, camping, boating.
- -Development of a bicycle trail at the site or through town.
- -Challenge or "outward bound" types of skill courses.

INDUSTRIAL ARTS:
- -Development of an outdoor classroom.
- -Construction of an environmental playground.
- -Pond or marsh construction.
- -Erosion control and stream habitat improvement.
- -Bird houses and feeders.
- -Construction of sampling equipment.

Some of these topics are discussed in a little more detail in the "Sample Plans" section.

As your students begin to collect data, information, plans, writings, or photographs, some provision should be made for cataloging and storage. All this material should be made accessible to other members of your team, to other interested groups, and to future study projects. One of the big problems facing many current environmental investigations is the lack of data concerning prior conditions. In order to discern whether a particular system has degraded or improved we must know what its past conditions were. By starting studies now you can provide a data base for future comparison. Your historical research may also give you some information to compare to current findings. By all means, keep all your information on file. What seems insignificant or useless now may be valuable later. The only "useless" information is that which is no longer available or not kept in the first place.

Keep in mind interdisciplinarity, action orientation, and integration with your on-going curriculum.

SAMPLE PLANS

This section includes three "Site Analyses" prepared for schools considering development of their properties. The New Garden Elementary School site is typical of what many schools have as a starting base: lawn. A courtyard was utilized at the Pennwood Junior High School. The Quakertown Community Schools used a much larger tract with existing woodlot and wet areas. The development and utilization suggestions prescribed for these specific sites could also be implemented on many other sites. Including them here serves several functions: to provide more detailed use and development instructions; to give an idea of the variety of useable natural sites; to suggest possible planning formats; and to illustrate what a completed inventory and plan might look like.

SITE ANALYSIS

DATE: November 19, 1974

TO: Mr. Kenneth Verlinden, Principal

PLACE: New Garden Elementary School
New Garden Road
Toughkenamon, Pennsylvania 19374
268-8493

FROM: Rick Tully, Environmental Specialist

I. SITE CONDITIONS

A. General: A rural school site with much lawn and few trees, some approximately twenty years old.

B. Size: The area being considered lies along the school's south boarder and is approximately 600 feet by 175 feet.

C. Topography: A flat section extends about 250 feet from the road. The land then slopes gently downward for an additional 350 feet.

II. DEVELOPMENT

A. Planning: To whatever extent possible, you should attempt to involve students and adult community members in your project. The more the students are involved in planning, the more they will be willing to protect and utilize the site in the future. Community adults can help by providing energy, ideas, physical help, supervision, or maybe even money. Please discard any of the following suggestions in deference to those of your students and adults. After all, they are going to use it.

B. Evergreen Plantings: Please refer to the map for the possible placement of trees. Three sections are indicated as part of a hedge to extend the length of the site. Do not plant in rows but with a more natural distribution. Please note that the hedge is of varying thickness to be more pleasing visually. Seedling trees are available at $11.00 per 1,000 from Nurseries, Bureau of Forestry, Department of Environmental Resources, Box 1467, Harrisburg, Pa. 17120. You should place an order in the fall or early winter for spring delivery. Once planted, the natural weedy growth should be allowed to remain to protect the maturing seedlings.

C. Deciduous Plantings: Three sections are indicated for deciduous plantings. Stock could be purchased from commercial nurseries, transplanted from local woods and hedgerows or purchased from the state. You might consider food trees such as oak, hickory, staghorn sumac, autumn olive and crab apple.

D. Wildlife Food Crops: To attract additional wildlife to the site, particularly birds, you could plant crops such as corn, sorghum, millet and/or sunflowers. In the fall you could harvest them for controlled winter feeding, or allow them to stand as a food resource for wildlife.

E. Bird Feeders: Feeding stations could be established in the same general area as the crop plots. By maintaining them through winter you should be able to establish a rather regular set of avian visitors. You could use either the seeds grown on site or seeds purchased in bulk from a local source.

F. Marsh: To increase habitat diversity while keeping liability problems to a minimum, you might consider establishing a marsh area rather than a deeper pond. Please refer to the "Marsh Plan" for a possible configuration. You should first excavate (preferably with student labor) an area of the desired size and to a depth of about 2 feet. After removing any projections from the bottom, you should lay a plastic liner to hold the water. Note several items in the diagram: the plastic liner is completely covered by soil, it extends beyond the actual marsh area and it rises in elevation to the intended water surface. The liner may need only be the 10 mil thick sheeting that construction crews normally use underneath poured concrete. You may be able to obtain some free locally. Once the plastic is in place you should refill the excavation with soil until the desired bottom profile is achieved. Any excess soil could be used for landscaping around the marsh. At two places on the perimeter of the marsh flagstones are indicated for convenience of access. Filling with water could be left to the rain and natural runoff from the slope above. In the unlikely event that sufficient water does not flow into the marsh, berms or low terraces could be constructed to divert additional water. Establishing plant and animal communities could also be left to nature but this would be a relatively slow process. Instead the students could survey local streams, ponds and marshes for suitable plants and animals to be transplanted to your marsh. You should attempt to establish a wide diversity of organisms, both for study and to increase the stability of your new biotic community.

G. Succession Plots: Four sites are designated on the map for succession studies. Succession is a normal process of orderly change which natural communities go through. By mowing each plot once every four years on a rotational basis, you would be maintaining four distinct stages of growth for comparative studies. If a greater repression of growth is desired you could plow or rototill once every four years instead of mowing.

H. Field: To provide additional habitat and study areas a field section could be established and mowed once or twice each year.

I. Outdoor Classroom: As use dictates, an established classroom site may be desirable. This can be constructed of old railroad ties, used utility poles or cut log sections. If arranged in a semicircle to accomodate 30 students, the resulting outdoor site would then be available for a variety of uses.

J. Trails: The presence of a trail can be used to protect fragile areas, to direct attention and to connect significant points of interest. Initially these may only be mown strips. As use increases wood chips could be used to provide a walking surface, especially in wet areas. Chips can usually be obtained free from landscape gardeners, Philadelphia Electric, Bell of Pennsylvania or your township maintenance crew.

K. Observation Blind: A later project may be to construct a blind to allow students to observe bird behavior without unnecessary disturbance. It could be a row of particularly dense plantings, a wooden barricade with viewing ports, or an actual building designed for observation.

L. Maintenance: A project such as this should result in a labor savings rather than an additional burden to the school custodial staff. Once established, most sites should be self sustaining. The students should be responsible for managing the marsh, food plots and trails. The only burden on the school maintenance crew would be to mow the field and succession plots.

III. UTILIZATION

A. Interdisciplinarity: The more you can involve a range of academic disciplines in the use of your site, the greater will be the benefits you receive. Though science is the typical user of a natural site it should not be the only user. Math, writing and art can all be easily involved. Please use the following suggestions only as a start.

B. Mapping: Plane table mapping is a simple but accurate surveying technique applicable to many grade levels. Once a map has been produced it can be used directly for planning development or can be used to construct a scale model (of sand, paper mache, cardboard or masonite) of the study site.

C. Horticulture: Basic planting and growth studies could be made with the tree and wildlife food plantings. Soil chemistry studies could be made with kits (such as are marketed by LaMotte Chemical Products Co.) designed specifically for elementary student use. Comparative studies could be made of growth rates in fertilized and unfertilized areas. Wild or domestic flowers could also be planted in other areas around the school.

D. Succession: The process of succession involves changes in living communities; that is, change in the types of plant and animal species and in the relative abundances of each type. One point in studying succession would be to observe and document those changes. On an introductory level this could mean the observation (visual, tactile, auditory and olfactory) and the recording of qualitative changes. Not only will the students be learning basic biologic principles, but more importantly they will be sharpening their powers of observation through the integrated use of all their senses. For quantitative types of studies, please apply quadrat, transect or diversity approaches described later.

E. Taxonomy: Plant and animal identification can be employed as a study technique, however it should only be a minor aspect of the program. Historically, taxonomy has turned more students away from natural studies than it has stimulated.

F. Insects: One group of animals easily available for study is the insects. Use them in investigations of life cycles, food webs, interrelations among species, niches, or behavior. You may also be able to document changes in insect populations relative to succession.

G. Birds: Bird study is an all-time favorite and should include much more than recognition and identification. Seasonality, food preferences, pecking orders, mating habits and nesting preferences are all study possibilities. You might be interested in the book "A Curriculum Activities Guide to Birds, Bugs, Dogs and Weather" available from the Institute for Environmental Education.

H. Mammals: Several species of mammals, or their signs can be found on your property, including dogs and field mice. Though both of these are quite familiar animals, they are rarely used for natural studies. For dogs, please see the above report. For mice, you could investigate their runways, dens, food habits, droppings and function in the food web.

I. Quadrat: One method of simplifying analysis of a site is to choose a small area (1 foot sq., 1 yard sq., 1 meter sq., the area within a hoola-hoop) in which intensive counts are made of species and numbers of individuals. These data can then be compared to data gathered at another site of the same surface area.

J. Transect: An allied sampling approach is the transect. In this technique a line is drawn across an area and all studies are done at specified intervals along the line. This can be especially effective in analyzing conditions that show a sequential change, such as the succession plots.

K. Diversity: A simple yet highly meaningful and useful statistical analysis of population numbers is the diversity index. Basically it is a measure of the variety of life found in any particular area. Variety is important to the stability of a system and to its ability to withstand environmental changes.

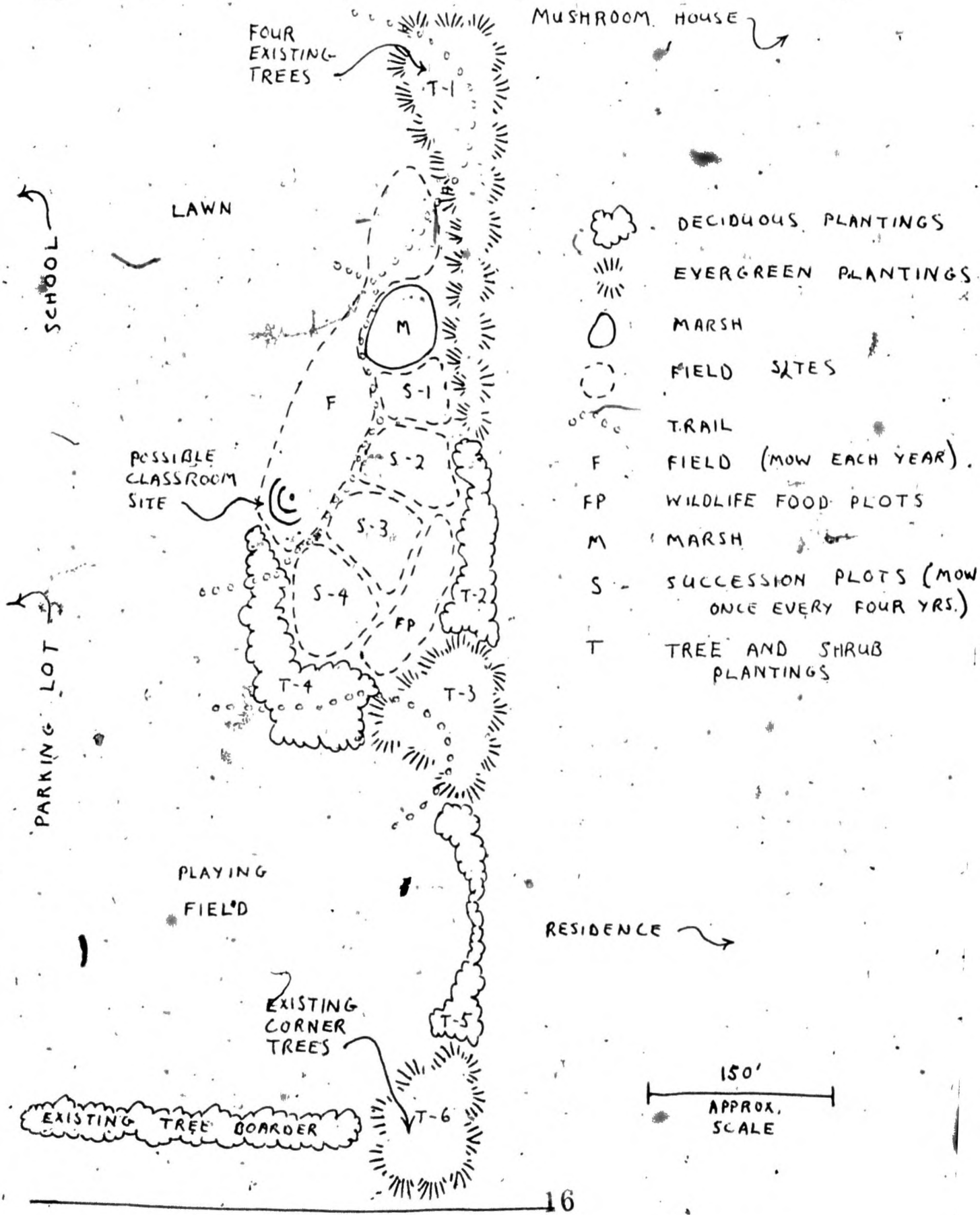
L. Weather: A weather station could be established on the open lawn between the school and the study sites. It could include equipment to measure current air temperature, daily maximum and minimum temperatures, precipitation, barometric pressure, wind speed and direction, and relative humidity. Students should be responsible for collecting all data and making daily weather forecasts to the rest of the student body. They should also record all data so that a "data bank" can be established.

M. Microclimates: Using your weather data as a base, you could make comparative studies of your various habitats and their respective conditions. For example, what effect does evergreen growth have on air temperature at ground level, at 3 feet, and at 6 feet in the summer as well as in the winter.

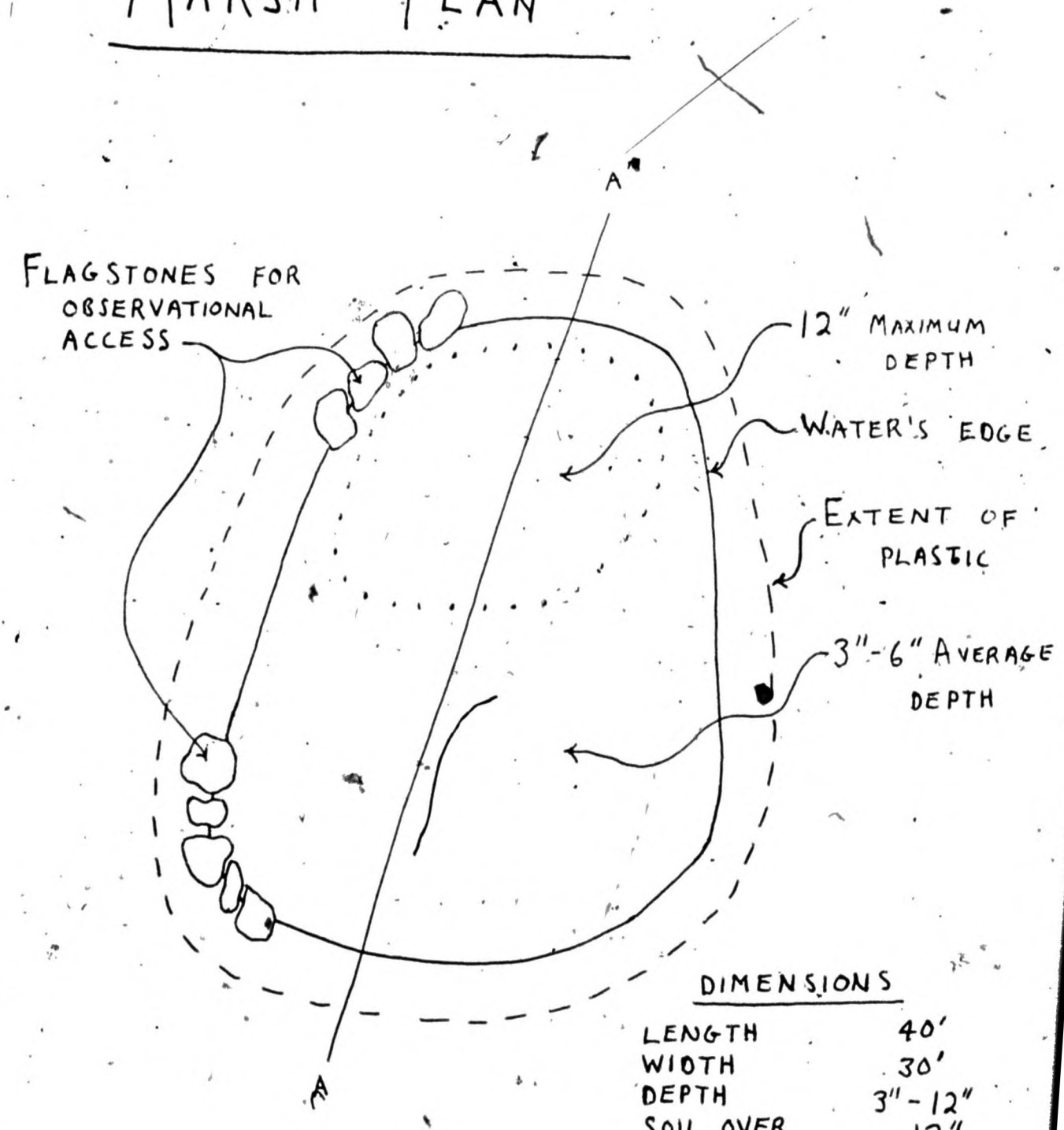
N. Quiet Time: Often the most meaningful experience a student has is one that involves all of his senses in a creative, emotional way. "Quiet Time" can be such an experience. Basicly it is a time for sensitizing, reflecting, and recording a personal experience. The record can be as a poem, a story, a drawing, or in any other medium.

O. Comparison Studies: Many sites exist in your area for comparative studies. Don't overlook lawns, fields, woodlots, hedgerows, streams, ponds and all the odd corners overgrown with weeds. These could all make excellent sites to increase the diversity of habitat areas available for study.

NEW GARDEN ELEMENTARY SCHOOL

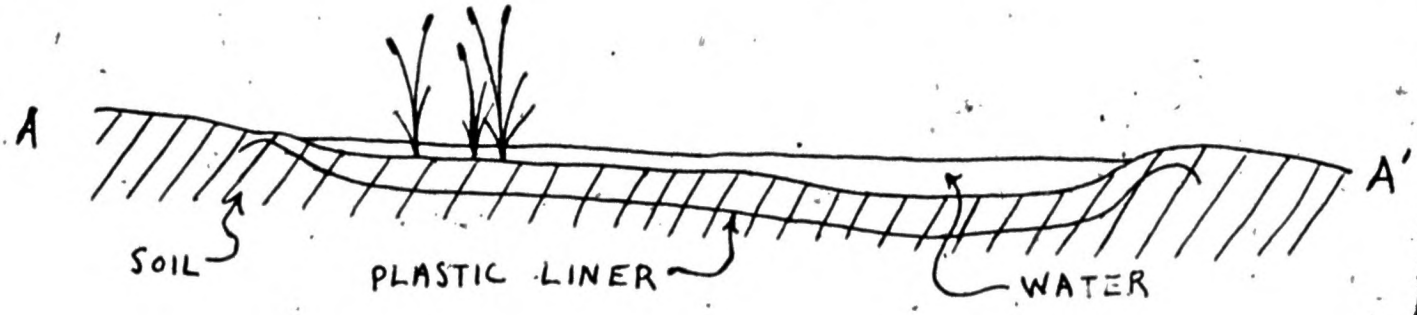


MARSH PLAN



DIMENSIONS

LENGTH	40'
WIDTH	30'
DEPTH	3"-12"
SOIL OVER LINER	12"



SITE ANALYSIS

DATE: October 30, 1974

TO: James Russock, Enviro-Planners

PLACE: Pennwood Junior High School
Makefield and Roelofs Roads
Yardley, PA 19067

FROM: Rick Tully, Environmental Specialist

I. INTRODUCTION

The following recommendations are based upon our meeting on Tuesday, October 22, 1974, to discuss the possibilities of developing the courtyard as an environmental study site with pond and marsh habitats.

II. CONSTRUCTION

Techniques involved here should be rather simple. Students equipped with shovels could do all the digging and landscaping. They need only excavate to the required depth and outline to prepare the hole. Some (not all) of the soil removed could be used to raise the pond site perimeter, which in turn would mean the original excavation need not be so deep. Once the pond is complete the surrounding land should still slope from the building walls to the pond edge. If there is an excess of soil you might use it as a landscaping resource. By placing it in a mounded semicircle, and planting it with grass, you would be creating a study area, an outdoor classroom, an aesthetic overall area. When digging the hole you might consider the recommendations indicated on the attached map. By giving the pond a figure-8 shape you could designate pond, medium-depth, and marsh sections (please note the terracing indicated on the A-A' cross-section). The pond edge cross-section indicates use of a plastic liner (try the 10-mil plastic construction crews use, possibly available free locally), placement of a rock boarder to protect and disguise the artificial sides, and use of a natural substrate covering the bottom. Prior to placing the plastic, the surface of the hole should be smoothed and all projections removed. The bottom material could be mud, sand, or gravel. You may want to cover certain areas of each depth section with a different substrate in order to monitor the various differences in resultant plant growth or animal use. Should the liner be punctured for some reason, the clay base of the soil could act to restrain the water and minimize any losses. The initial filling may require bringing water to the pond from school faucets. Hopefully rainwater will be sufficient to sustain an adequate level. Stocking the pond with plant and animal life would be the next priority. This should be a continuous learning activity for the students and will be discussed later.

III. MAINTENANCE

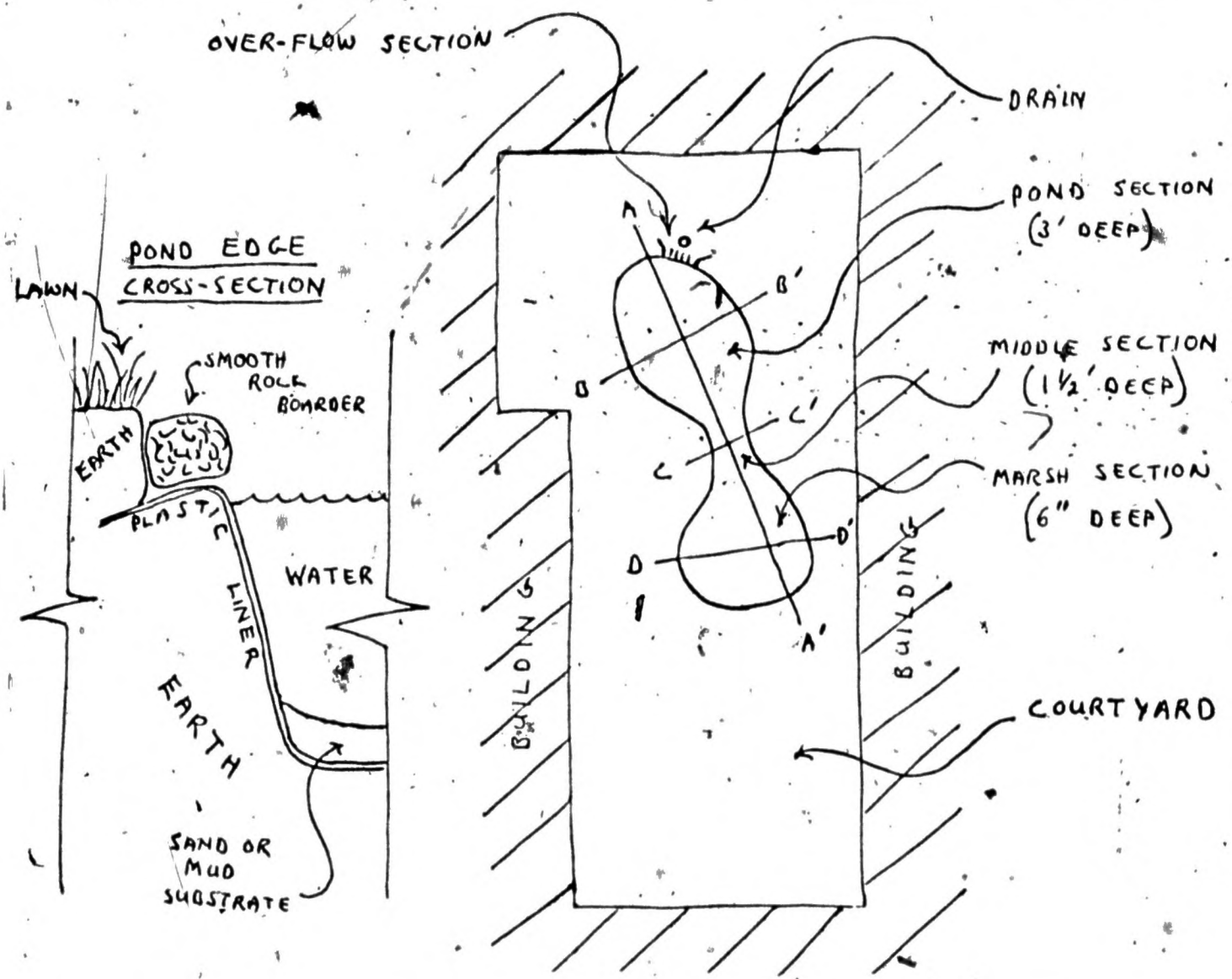
Once the courtyard is accepted as a study area, all maintenance should be the responsibility of the students. Pond care will be dependent upon the conditions desired. Should algae blooms pose a problem, the excess algae should simply be harvested and removed from the pond. This will retard growth, improve appearance, and remove unwanted nutrients from the water. Any care required by the surrounding land areas (such as mowing, trimming, planting) should be done by the students as a learning experience.

IV. UTILIZATION

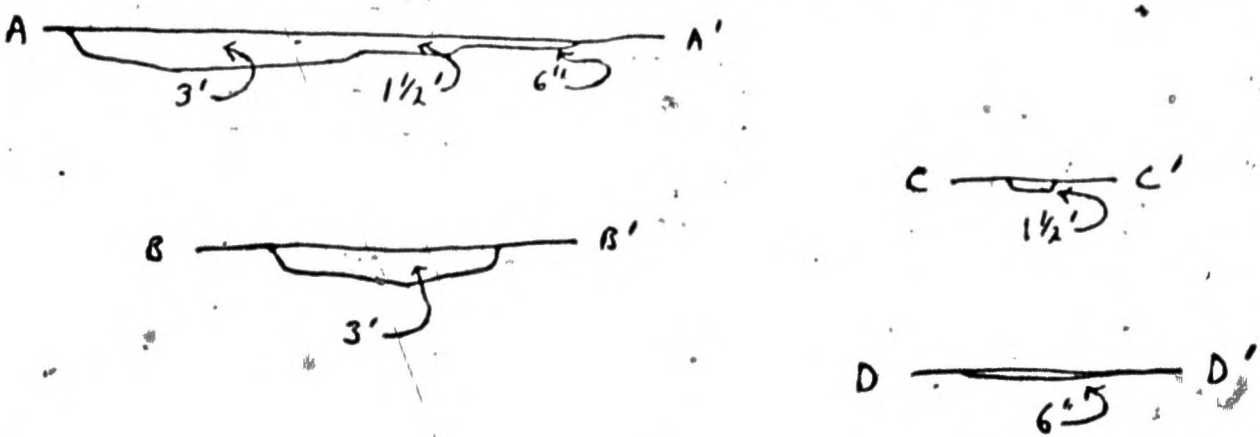
Ideally this would become an area for use by all disciplines and classes in the school. Art: sketching, drawing, painting; English: creative writing; Math: mapping, measuring; Psychology: bird behavior, territoriality; Horticulture: planting, maintenance; Aquatic biology: pond construction, maintenance study; Industrial arts: construction of feeders, houses, benches; and Chemistry: study of soil, air, and water conditions. Of most concern here, though, is direct use of the pond itself. Initially students should do studies of existing local streams, ponds, and marsh areas to determine what natural conditions are and to determine what conditions are desired for this pond. These natural sites could, in turn, act as a source of plant and animal stock for your own site. Plants you might consider could include: Phragmites sp., cattails, sedges, waterlilies, duckweed, and a variety of algaes. Maintenance of an animal population will be dependent upon your success with the plants; some to consider include: frogs, toads, salamanders, minnows, darters, mosquito fish, sunfish, and a variety of macroinvertegrates, all collected locally. The study, collection, and establishment of these species would be learning in itself. Additionally on-going studies should be made to monitor pond conditions. There could be an unending series of studies in water chemistry, food web analysis, progression of succession, changes in macroinvertebrate diversity, and animal behavior. The site could also be a source of materials for in-depth classroom studies.

PENNWOOD JR. HIGH SCHOOL

COURTYARD DEVELOPMENT



CROSS-SECTIONAL BOTTOM PROFILES



SITE ANALYSIS

DATE: October 9, 1974

TO: Mary Steckel

PLACE: Quakertown Community School District
600 Park Avenue
Quakertown, PA 18951

FROM: Rick Tully, Environmental Specialist

I. SITE CONDITIONS

A. Size: Approximately 10 acres.

B. Topography: Flat with several long mounds of earth bulldozed from the immediate vicinity. Poorly drained. One large L-shaped area is more-or-less permanently submerged making a shallow lake or marsh.

C. Habitat Types: Woodlot, field, lawn, bare ground, marsh, pond.

D. Service Population: Quakertown High School, Quakertown Intermediate School, feeder Elementary Schools, local clubs and organizations (Boy Scouts), and the general Quakertown populace.

II. BIOTA

A. Trees: White oak (Quercus alba), red oak (Quercus rubra), possibly pin oak (Quercus palustris), American elm (Ulmus americana), white ash (Fraxinus americana), shagbark hickory (Carya ovata), osage-orange (Maclura pomifera), red-osier dogwood (Cornus stolonifera).

B. Other Flowering Plants: Poison ivy, (Rhus radicans), raspberry, (Rubus sp.), wineberry (Rubus sp.), blackberry (Rubus sp.), Virginia creeper (Parthenocissus quinquefolia), bulrushes (Scirpus sp.), little bluestem (Andropogon scoparius), foxtail grass (Hordeum sp.), wild onion (Allium sp.), strawberry (Fragaria sp.), violet (Viola sp.) morning glory (Ipomea sp.), plantain (Plantago sp.), milkweed (Asclepius sp.), dogbane (Apocynum sp.), smartweed (Polygonum sp.), pokeweed (Phytolacca americana), winter cress (Barbarea sp.), wild mustard (Brassica sp.), cinquefoil (Potentilla sp.), common evening primrose (Oenothera biennis), bitter sweet (Solanum dulcamara), jewelweed (Impatiens capensis), wood sorrel (Oxalis sp.), Queen Anne's lace (Daucus carota), heal-all (Prunella vulgaris), wild mint (Mentha arvensis), water-purslane (Ludwigia palustris), burdock

(Arctium sp.), bull thistle (Crisium vulgare), yarrow (Archillea millefolium), chicory (Cichorium sp.), tall goldenrod (Solidago altissima), New England aster (Aster novae-angie), and small white aster (Aster vimineus).

C. Animals: Mosquitos, oak stem gall formers, cicadas, crickets, grasshoppers, monarch butterflies, miscellaneous flies, bumble bees, honey bees, sweat bees, ducks, rabbits, muskrats. These thirteen species do not represent all the ones potentially available for study but only the ones actually observed or for whom signs were found.

III. DEVELOPMENT

A. Dirt Piles: The initial development consideration should be the utilization of the many dirt mounds (please see "Earth Movements" map). Most could be spread into low broad mounds to provide areas of drier soil conditions. Do not spread the soil uniformly over the entire area as this would hinder rather than help existing drainage conditions. The mound that projects between the two wings of the pond might be left and utilized as an observation point.

B. Aquatic Areas: The existing wet sites could be developed into three major zones: pond (2-3 feet deep), marsh (0-1 foot deep), and a low island (again please see map). The overall perimeter could be adjusted so as not to be so rectilinear but more naturally shaped. The existence of an island would provide a protected nesting site for wildlife.

C. Terrestrial Areas: This involves wet fields, dry fields, the existing woodlot, and proposed plantings (see map). The wet and dry fields would be maintained on the open areas by periodic mowing. A suggested regimen would be to mow any particular sector once every four years. By mowing four sectors on a rotational basis you would be maintaining successional stages of one to four years old. A more drastic alternative to mowing would be to rototill or plow the sectors. This would be setting succession back one further step (please see "Mowing Sectors" map). The existing woodlot needs little but poison ivy control. Try cutting the vines in the winter when the leaves have dropped. Keep in mind that they still can cause irritation and avoid any direct contact. Next spring as the leaves emerge spray Ortho Poison Ivy Spray directly on the plants. Care should be exercised so as not to damage surrounding plants any more than necessary. The brush piles should be maintained as small refuges for wildlife. Any over three feet or so tall could be divided into more than one pile in separate locations.

The planting of additonal trees and shrubs could be one of the major on-going projects at the center. Initially a border of trees and shrubs would help to delimit the extent of the study site. As they grow they would begin to isolate the area from outside distractions. You may want to devote certain areas of the field to the growth of wildlife food crops such as corn, wheat, sunflowers, or beans.

D. Trail System: By developing a well-planned trail system you not only provide easy access to certain areas but you also control the movements of people through the area. Some factors to keep in mind are: the sites you wish to reach, the sizes of the groups using the trail, access routes from schools, the aesthetic and emotional impact, and the fact that broad curves are superior to straight stretches or tight curves. In the wet field areas you may need to raise the trail slightly above the surroundings. A suitable material might be the discarded roofing shingles as a base, covered with wood chips. Through the forest and drier field areas you may not need to provide a special surface rather only enough indications of the trail to direct its use (logs, rocks, woodchips, or merely bared earth).

The section requiring greatest construction attention would be the part across the marsh. Several approaches are possible: using old railroad ties as a corrugated walkway, using horizontal railroad ties as a base for boards lying on top of them, using telephone pole sections or railroad ties as upright posts for a more elaborate bridge system, and finally there are several large cement beams near the dirt road border that could be placed on the marsh as solid walk-ways.

E. Study Sites: Ten potential sites are indicated on the map, basicly you should provide a study site for each different habitat area. Development of a site could be nothing more than a widening of the trail to allow the whole group close access to the leader. At the other extreme you could provide log benches for semi-circular seating. Start with the simple ones and see how the need develops. Four field sites are indicated, one in each of the succession sectors. The bird blind could be constructed from the steel boiler section discarded on the site. By placing it upright and having the industrail arts classes cut viewing ports and a door with an acetyline cutting torch you would have a nearly indestructable blind. In front of the blind you may wish to place feeders, houses and food crops to attract additonal birds.

IV. ACTIVITIES

A. Interdisciplinarity: The more you can utilize a variety of disciplines in the use and study of your site, the greater will be the students' appreciation of the area. Try to encourage other teachers (science, math, english, art) to utilize the site as part of their own courses. Better yet try to involve them in the overall project to truly integrate the separate disciplines.

B. Planning and Development: Utilize student expertise, attitudes, desires, and labor throughout the project. Please disregard recommendations I may make in deference to those of the students. They're the ones who'll use and benefit from the place and a wrong decision they might make can be far more educational than being told the "right" decision. They may also have a clearer idea of local needs and possibilities.

C. Other Schools: Open the facility to other school groups and you will be gaining extra hands for development and maintenance as well as be spreading environmental education far beyond your immediate classroom contacts.

D. Community Use: The adult community, as well as youth groups can be of tremendous benefit to you, and you to them. Here is an opportunity to tap local knowledge, expertise, ability, and physical resources. The site in turn can provide passive recreation to area residents through bird-watching and nature study.

E. Vandalism: The broader the spectrum of support you draw upon, the less your vandalism problems will be. If vandalism is apparent, whether malicious or mischievous, try to identify the perpetrators. Rather than punish them, try to provide a program at the center that will actively and usefully occupy their energies. They then consider it "their" center and will protect rather than destroy it.

F. Walkbooks and Guides: These should be aides to understanding rather than ends unto themselves. Permanent interpretive signs, guidebooks keyed to number stakes, identification keys, maps, activity guides, and trained student leaders are all possibilities. Decide first of all who the guide is intended for (teachers, students, adults, scouts), secondly what they want to know, and finally what would be the most effective approach. To my mind, a most useful direction would be to train High School students as naturalists who would personnaly help user groups to write their own field guides to the center.

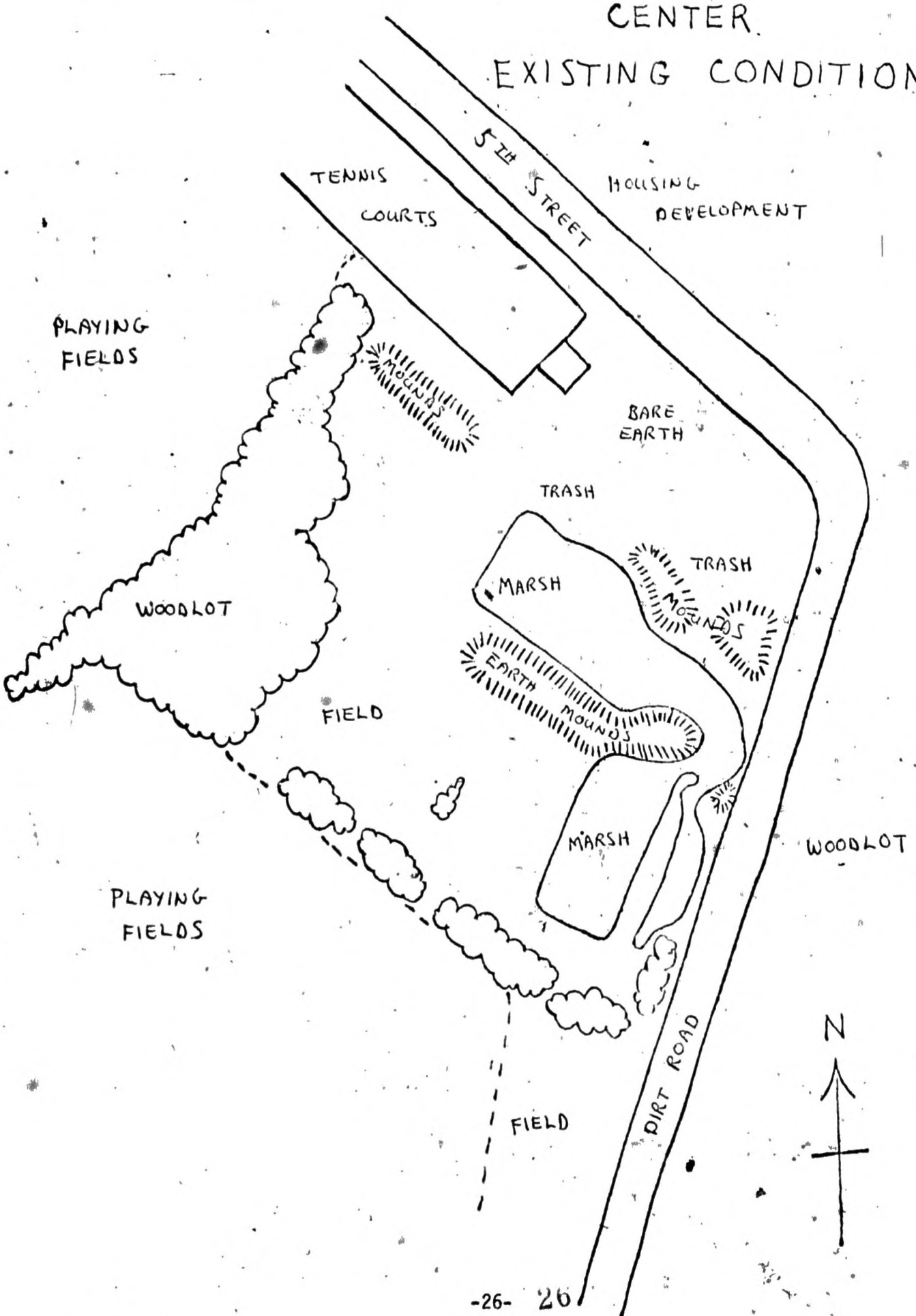
G. Comparative Studies: One great advantage to this site is its habitat diversity. There are differences among the habitats that can be studied through plant species structure and diversity, microclimatic changes, soil chemistry, animal populations and a host of other factors. Virtually anything you can do in one area can be done in another to the enlightment of both.

H. Herbarium: The High School botany class or club could establish quite an herbarium solely from collections from the center.

I. Composting: As a service to your community and a ready source of trail surface and organic soil enrichment, the center could serve as a compost collection and distribution center. Grass clippings, leaves, and Christmas trees could all be chipped, shredded, and composted at the site. The excess that you cannot use could be given back to the community on a you-pick-it-up basis.

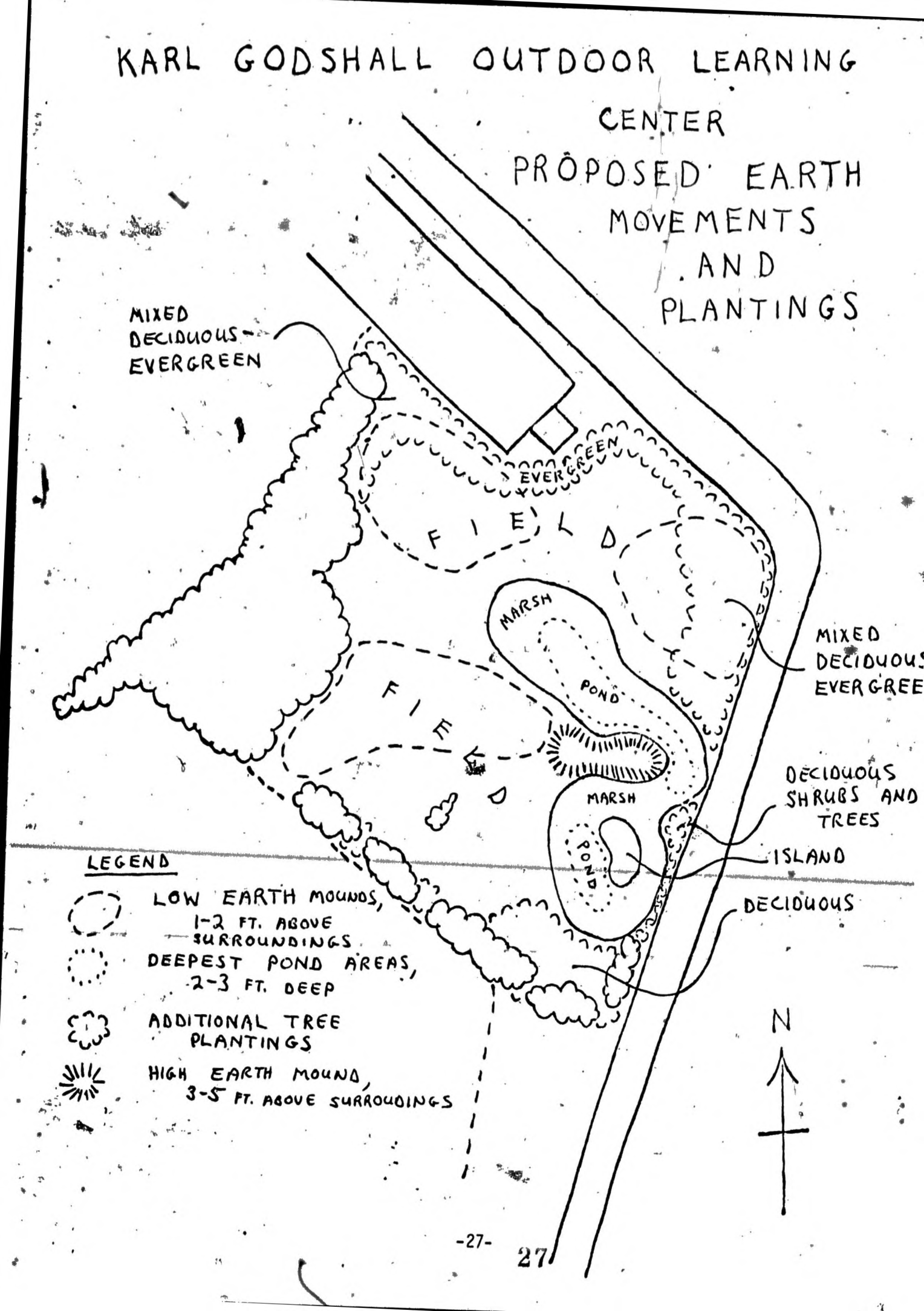
KARL GODSHALL OUTDOOR LEARNING CENTER

EXISTING CONDITIONS



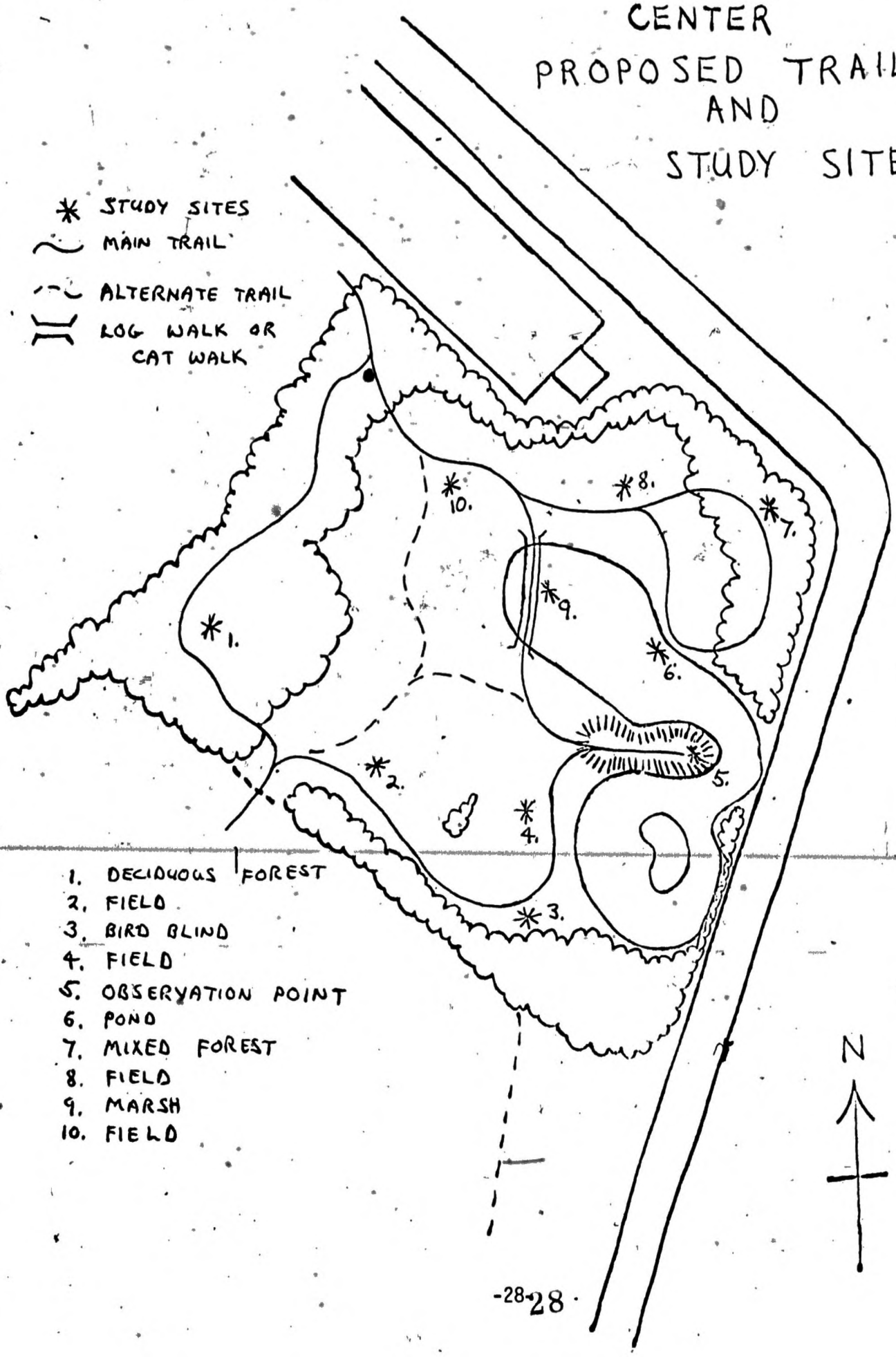
KARL GODSHALL OUTDOOR LEARNING CENTER

PROPOSED EARTH MOVEMENTS AND PLANTINGS



KARL GODSHALL OUTDOOR LEARNING CENTER

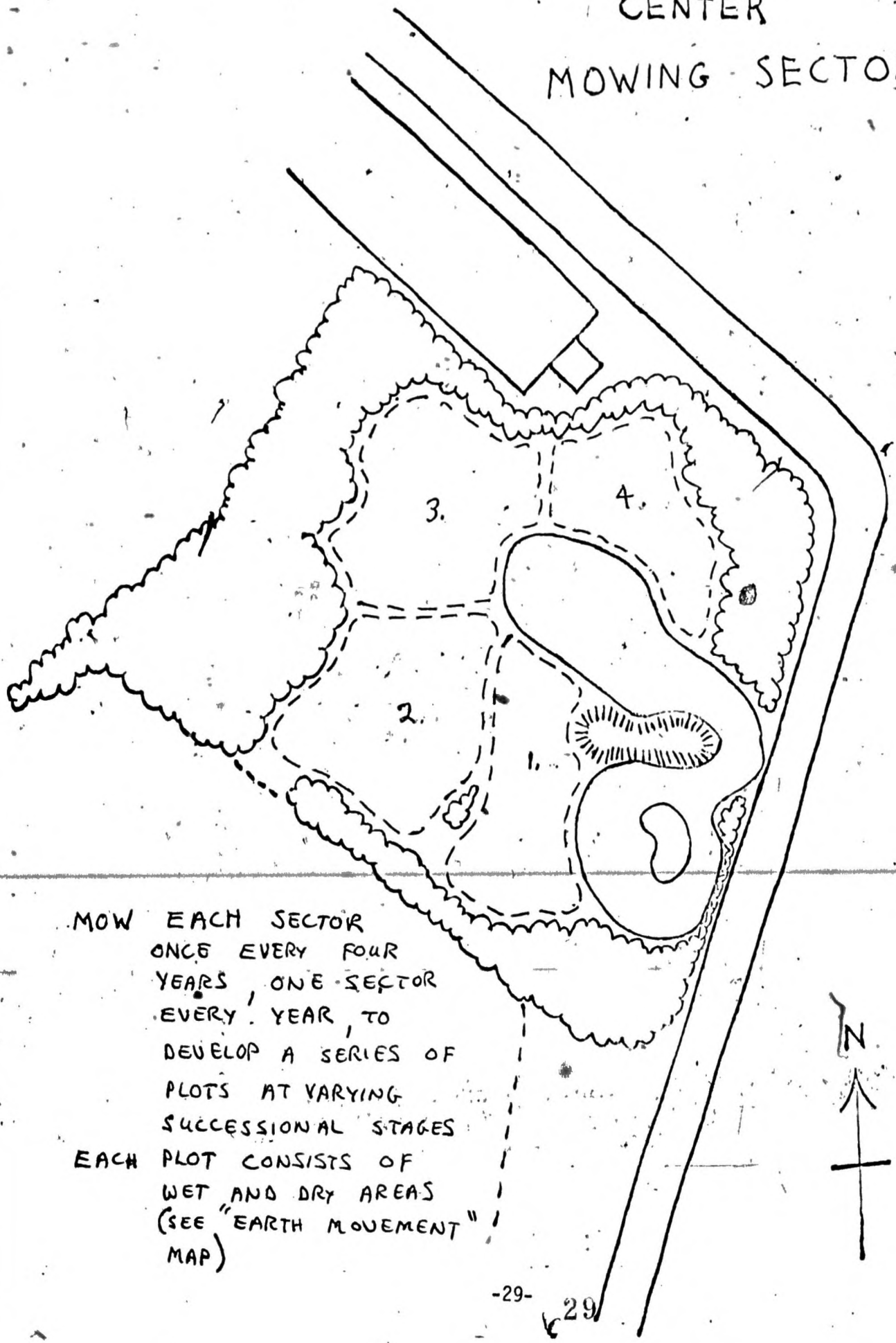
PROPOSED TRAILS AND STUDY SITES



1. DECIDUOUS FOREST
2. FIELD
3. BIRD BLIND
4. FIELD
5. OBSERVATION POINT
6. POND
7. MIXED FOREST
8. FIELD
9. MARSH
10. FIELD

KARL GODSHALL OUTDOOR LEARNING CENTER

MOWING SECTORS



MOW EACH SECTOR ONCE EVERY FOUR YEARS, ONE SECTOR EVERY YEAR, TO DEVELOP A SERIES OF PLOTS AT VARYING SUCCESSIONAL STAGES

EACH PLOT CONSISTS OF WET AND DRY AREAS (SEE "EARTH MOVEMENT" MAP)

MANAGEMENT

The coordination or management of your project should reflect your educational goals. Here is an excellent opportunity to help your students aquire another set of skills. As much as possible, have them "run the show".

A steering committee or advisory committee can be of great benefit to your project. Make room for, and actively recruit representatives from adminstrative, teacher, student, and community groups. Their functions could include advice, direction, expertise, liaison with other groups; technical assistance, field trip assistance, funds or materials, volunteer aid, etc.... You may wish to consider the standard flow charts, time schedules, and budgets to help document your managerial approaches.

Funding often proves to be a project's biggest stumbling block. All too often we tend to see the aquisition of large amounts of money as necessary prior to beginning a project. Some of the most successful projects have been done with near-zero budgets. Before looking for money, look for things to be done. Student involvement is our goal, not the establishment of a monument to our efforts. Continually ask yourself if it couldn't be done more cheaply. If you need to cross a creek, don't start thinking of permanent concrete bridges, but look for stepping stones. If you want an outdoor classroom, don't research amphitheater architectural catalogs, have the kids scrounge logs and boards. To ask for funding before you've proved yourself is the wrong tact. Show what you can do for nothing and support is easier to rally.

If you are actively searching funds, start close to home. Are there monies in the school budget that could apply? Can the students or PTA organize bake sales or recycling programs? Your next contacts could be the local businesses and community agencies. In approaching your community, look not only for funds but also for materials, equipment, and expertise. Often this will provide you with great money savings for a small money investment on the part of the donor. You still need more? Then try philanthropic agencies. You can locate them by refering to the Foundation Directory at your public library. Your State Department of Education can also be of help with funds and referral. The federal government offers grants too. Check the Catalog of Federal Domestic Assistance, the Federal Register, the Congressional Record, local representatives, and local offices of federal agencies. Federal surplus property can also prove helpful. Check with your "State Agency for Surplus Property" through your State Department of Education.

Your management planning should streamline your efforts rather than be just one more thing to do.

Good luck and have fun.

BIBLIOGRAPHY

The best bibliography of outdoor sites would have at its core a list of all the ideas and abilities of your students, their parents, and the community at large. Those not being available to me, my list is far shorter than it should be. I've tried to include at least a taste of the materials available at planning, development, use, and management levels. Use this only as a start.

PRINTED MATERIALS

1. Design with Nature
   by Ian L. McHarg

   Doubleday/Natural History Press
   Doubleday & Company, Inc.
   Garden City, NY
   1969, 198 p.
   ($5.95 - paperback)

   A humanly scientific approach to man and his relationship with the environment. A call for planning with nature, not against it.

2. Developing Environmental Study Areas
   by Jonathan M. Wert

   Environmental Education Section
   Division of Personnel
   TVA
   Knoxville, TN 37902
   1974 August

   A development workbook and bibliography.

3. Environmental Education/Facility Resources

   Educational Facilities Laboratories
   477 Madison Avenue, NY, NY
   1972, 64 p.
   ($2.00)

   Review of schools, school sites, community facilities, regional centers, and planned facilities. List of information sources.

4. Environmental Education Reference Sources

   Division of State & Private Assistance
   National Park Service
   U.S. Dept. of the Interior
   Washington, D.C. 20240

   Annotated bibliography of sources of assistance (funding, consultation, materials, personnel, programs).

5. Environmental Education Report
   a. "Wey-ing Environmental Education Possibilities" by Sally Done
   b. "Economic Planning & Design Decisions" by Karl W. Grube

   Environmental Educators, Inc.
   1621 Connecticut Ave., N.W.
   Washington, D.C. 20009
   1975 November

   Learning can still be fun, in environmental schoolyards. Some economic considerations in school site selection.

6. A Guide to Campus Improvement and Beautification
   by D. Lloyd Scott and Michael A. Magnoli

   Mobile County Public Schools
   P.O. Box 1327
   Mobile, AL 36601
   1975, 14 p.
   ($1.00)

   Nine steps to campus beautification including: administration, goals, resources inventory, and implementation.

7. How to Lead a Field Trip

   Ward's Natural Science Establishment, Inc.
   P.O. Box 1712
   Rochester, NY 14603
   1970, 20 p.
   ($.25)

   A guide to field trips: pre-trip preparation, suggestions for a variety of activities, post-trip follow-up.

8. Interpreting our Heritage
   by Freeman Tilden

   Chapel Hill Books
   University of North Carolina Press
   Chapel Hill, NC
   1957, 120 p.

   The guide to the interpretation of human and natural history.

9. Investigation of Criteria Involved in Selection and Development of Sites for Outdoor Use
   by R. Neil Nelson

   Michigan State University
   East Lansing, MI
   1972, 8 p.

   Criteria lists with individual factors value-weighted for use in a composite analysis.

10. Invite Birds to Your Home
Soil Conservation Service

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
1969 December
($.25)

Descriptions of plants and landscaping arrangements.

11. Man and His Environment

Publications-Sales Section
National Education Assoc.
1201 16th Street, N.W.
Washington, D.C. 20036
1970, 56 p.
($1.75)

An introduction to environmental study areas as conceived by the National Park Service.

12. A Nature Center for Your Community
by Joseph J. Shomon

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022
1962, 40 p.
($1.00)

Value, objectives, elements, sample plan, and costs of a nature center.

13. Outdoor Classrooms on School Sites
Soil Conservation Service

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
22 p.
($.25)

Planning, development and utilization of the school site.

14. Outdoor Conservation Education
by Joseph J. Shomon

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022
1964, 96 p.
($2.00)

Overview of outdoor conservation education, philosophy, techniques, administration.

15. Outdoor Interpretation
by Joseph J. Shomon, Ed.

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022
1968, 104 p.
($3.00)

Survey of programs at a variety of sites.

16. Papers
by George J. Knudsen

Association of Interpretive Naturalists
6700 Needwood Road
Derwood, MD 20855

Suggestions for nature hikes. Techniques to reduce vandalism.

17. Places for Environmental Education

Educational Facilities Laboratories
477 Madison Ave., NY, NY 10022
1971, 14 p.
(single copies free - multiple copies, $.25 each)

Good introduction to site utilization.

18. Planning a Nature Center
by Byron L. Ashbaugh

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022
1963, 88 p.
($2.00)

Survey of purpose, needs, resources, planning, site, facilities, and staffing of a nature center.

19. Planning Guide for School Sites

Environmental Science Center
5400 Glenwood Avenue
Golden Valley, MN 55422

Useful in early planning and development stages.

20. Playgrounds for Free
by Paul Hogan

Playground Clearing House, Inc.
26 Buckwalter Road
Phoenixville, PA 19460
250 p.
($9.95 - paper)

Build a playground from materials scrounged locally or purchased at low cost.

21. Reading the Landscape: An Adventure in Ecology
by May Theilgaard Watts

The Macmillan Company
866 3rd Avenue
New York, NY 10022
1957, 230 p.

13 excellent essays of the records "written on the land".

22. School Site Development for Conservation and Outdoor Education
by Eleanor H. Bennett

Pennsylvania Dept. of Educatio
Box 911
Harrisburg, PA 17126
1972, 15 p.

Short introduction to sites, habitats, activities, and development procedures.

23. The School Site in Environmental Education
by Richard H. MacGown

Maine Environmental Education Project, Title III, ESEA
Yarmouth, ME
1971, 35 p.

Review of site resource analysis and development concepts.

24. The Science Teacher
a. "Establishing a School Nature Study Area" - page 11
by Ron Vander Velden
b. "K-12 Natural History Visitation Site" - page 43
by Kenneth M. Highfill
c. "A Brief Analysis of the Terrestrial Plant Ecology and Soil Composition in Camp Mary Day" - page 45
by Harold Wiper

The Science Teacher
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009
June, 1975

Various approaches to site use and development.

25. Ten Minute Field Trips: Using School Grounds for Environmental Studies
by Helen Ross Russell

Doubleday/Ferguson
Chicago, IL
1973

Short trips to sites traditionally considered limited.

26. Trial Planning and Layout

Nature Center Planning Divisio
National Audubon Society
950 3rd Avenue, NY, NY 10022
1971, 76 p.
($3.00)

27. Use That Campus

Division of Forestry, Fisherie & Wildlife Development
TVA
Morris, TN 37828

A plea for the preservation of the natural landscape during school construction and suggestions for its use.

28. Wildlife Habitat Improvement
by Shomon, Ashbaugh, Tolman

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022
1966, 96 p.
($2.50)

Upgrading habitat at homesites, farms, and special areas for birds and mammals.

29. Yellow Pages of Learning Resources

Group for Enviromental Education
1214 Arch Street
Philadelphia, PA 19107
($1.95)

What can you learn from people, places, processes? Using community resources for education.

ORGANIZATIONS

1. American Camping Association, Inc.

Bradford Woods
Martinsville, IN 46151

Some books and information available, especially regarding residential camps.

2. Game Food Nurseries

P.O. Box 2371
Oshkosh, WI 54901

Seeds and seedlings of wildlife food plants.

3. National Audubon Society

Nature Center Planning Division
National Audubon Society
950 3rd Ave., NY, NY 10022

Consultation and publications.

4. Natural Science for Youth Foundation

763 Silvermine Road
New Canaan, CT 06840

Free consultation regarding establishment, funding, and management of natural science centers.

5. United States Department of Agriculture

Forest Service, and Soil Conservation Service
U.S. Dept. of Agriculture
Washington, D.C. 20250

Many pamphlets, brochures, information services available.

6. United States Department of the Interior

Bureau of Land Management,
Bureau of Outdoor Recreation,
Bureau of Sport Fisheries
and Wildlife, and
National Park Service
U.S. Dept. of the Interior
Washington, D.C. 20240

Great variety of services including consultation, publications, and funding.

SITE ANALYSIS INVENTORY CHECK LIST

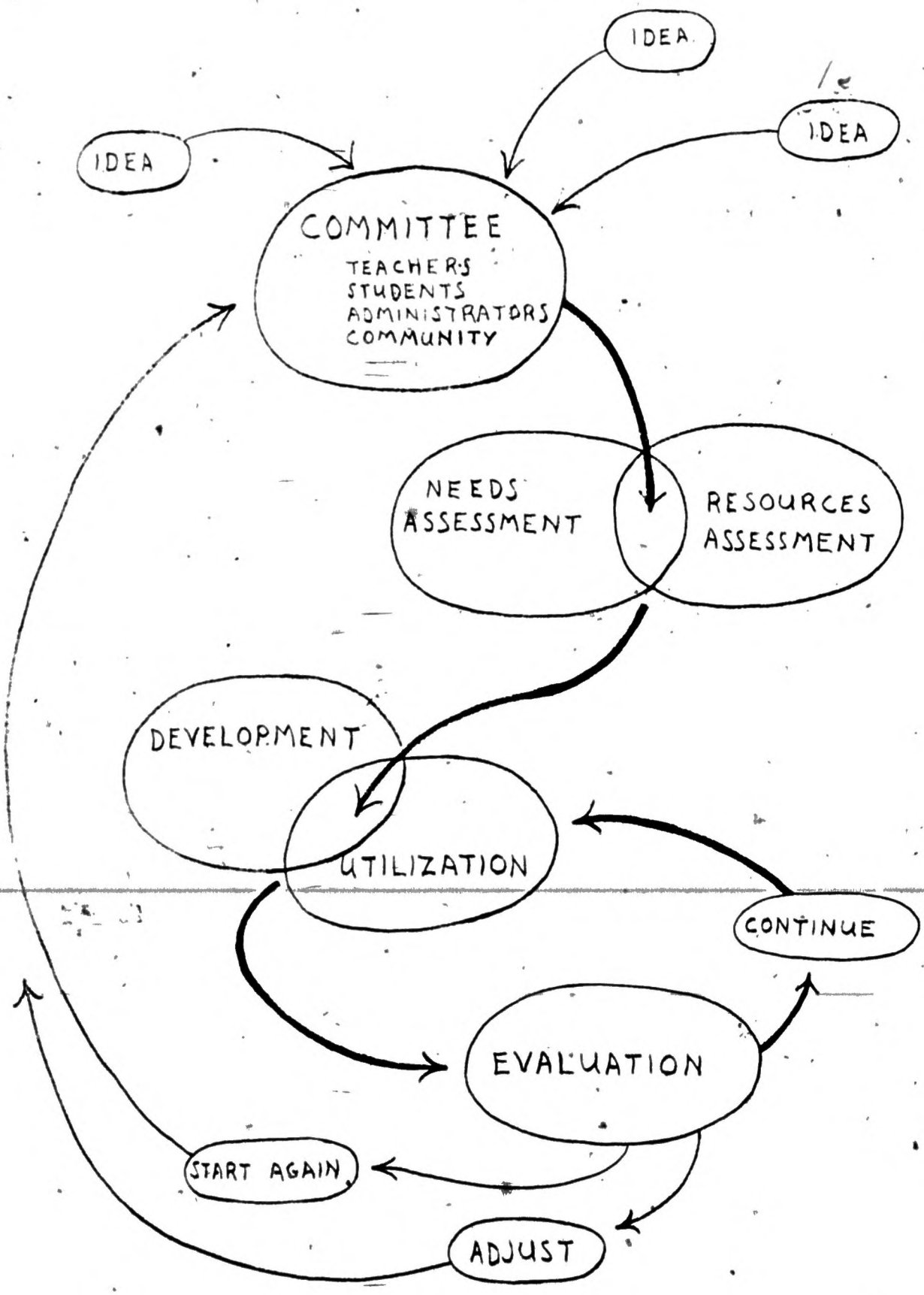
Date
Location
Names of Investigators
Site Conditions:
- General Comments
- Most Significant Attractions
- Size:
  - Area
  - Shape
- Topography:
  - Slope
  - Exposure
- Geology:
  - Bedrock
  - Soil
- Habitat Types:
  - Aquatic: Streams, Rivers, Lakes, Ponds, Marshes
  - Terrestrial: Field, Forest, Human-Created
- Biota:
  - Microscopic Organisms
  - Trees
  - Non-Woody Flowering Plants
  - Non-Flowering Plants
  - Animals
- Access
- Ownership
- Existing Use

Development Possibilities:
- Landscaping
- Planting
- Habitat Improvement
- Trails
- Study Sites
- Classrooms
- Maintenance
- Compatibility to Existing Use
- No Further Development Needed

Utilization:
- Service Population/Target Group
- Suggestions by Site
- Suggestions by Discipline
- Suggestions by Topic
- Recreation/Education

Other:
- Maps
- Photos
- Sketches

Conclusions:
- Special Advantages/Attractions
- Special Problems/Limitations


IDEA
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IDEA
COMMITTEE
TEACHERS
STUDENTS
ADMINISTRATORS
COMMUNITY
NEEDS ASSESSMENT
RESOURCES ASSESSMENT
DEVELOPMENT
UTILIZATION
CONTINUE
EVALUATION
START AGAIN
ADJUST